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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,653	03/29/2004	Charles M. Lieber	H0498.70112US01	3416
7590 04/25/2008 Timothy J. Oyer, Ph.D. Wolf, Greenfield & Sacks, P.C. 600 Atlantic Avenue Boston, MA 02210				
EXAMINER WEISS, HOWARD				
ART UNIT 2814		PAPER NUMBER		
MAIL DATE 04/25/2008		DELIVERY MODE PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/812,653

**Applicant(s)**

LIEBER ET AL.

**Examiner**

Howard Weiss

**Art Unit**

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 March 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3,5,7-10,13,14,16-18,20-23,56-59,90-104,107-112 and 114-150 is/are pending in the application.
- 4a) Of the above claim(s) 146-149 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,5,7-10,13,14,16-18,20-23,56-59,90-104,107-112,114-145 and 150 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 1107.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

Attorney's Docket Number: H0498.70112US01

Filing Date: 3/29/04

Continuing Data: Continuation of 10/033,369 (10/24/01 now U.S. Patent No. 6,781,166)  
which is a Continuation of PCT/US00/18138 (6/30/00) and claims  
benefit of 60/142,216 (7/2/99); RCE established 11/2/2007

Claimed Foreign Priority Date: none

Applicant(s): Lieber et al. (Rueckes, Joselevich, Kim)

Examiner: Howard Weiss

***Election/Restrictions***

1. Applicant's election of the Group I invention, Claims 1, 3, 5, 7 to 10, 13, 14, 16 to 18, 20 to 23, 56 to 59, 90 to 104, 107 to 112, 114 to 145 and 150, in the reply filed on 3/3/2008 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).
2. Applicant's traversal of the specie restriction in the reply filed on 3/3/2008 is acknowledged and has been found persuasive. This restriction requirement has been withdrawn.

***Claim Objections***

3. Claims 110 and 111 recite the limitation "the nanotube" in Line 1. There is insufficient antecedent basis for this limitation in the claims.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:  
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
5. Claim 104 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 104 states that the second wire is a metallic

nanotube. However, Claim 103, from which Claim 104 depends, establishes the second wire to be a semiconducting nanotube which contradicts the limitation in Claim 104.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Initially, and with respect to Claims 56, 57 and 114 to 117, 119, 121, 124, 126, 133 and 134, note that a "product by process" claim is directed to the product per se, no matter how actually made. See *In re Thorpe et al.*, 227 USPQ 964 (CAFC, 1985) and the related case law cited therein which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. As stated in Thorpe,

even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348,

*162 USPQ 145, 147 (CCPA 1969); Buono v. Yankee Maid Dress Corp., 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935).*

Note that Applicant has burden of proof in such cases as the above case law makes clear.

8. Claims 1, 3, 5, 7 to 10, 13, 14, 16 to 18, 20 to 23, 56 to 59, 90 to 97, 107 to 112, 114 to 121, 123 to 130, 132 to 136, 138, 139, 140 and 150 are rejected under 35 U.S.C. 103(a) as being unpatentable over Melzner et al. (U.S. Patent No. 5,774,414) and Brandes et al. (U.S. Patent No. 6,445,006).

Melzner et al. show most aspects of the instant invention (e.g. Figures 2 and 3) including an electrical crossbar array comprising two crossed conductors **3,11** defining memory elements switchable between two readable states **U,O**, free of auxiliary circuitry and one of the wires movable from a first position to a second position.

Melzner et al. do not show the conductors in electrical or Van der Waals contact and to be nanoscopic being made of single or multiwall carbon nanotubes and auxiliary circuitry including transistors, capacitors and contact electrodes. Brandes et al. teach (e.g. Figure 9 and Column 2 Lines 31 to 40) to have auxiliary circuitry **1015** including transistors, capacitors (Column 10 Lines 6 to 11) and contact electrodes wires **678, 679** in electrical or Van der Waals contact and made of single or multiwall carbon nanotubes to capitalize on the semiconducting properties of carbon nanotubes (Column 8 lines 1 and 2). It would have been obvious to a person of ordinary skill in the art at the time of invention to have wires in electrical or Van der Waals contact and made of nanoscopic single or multiwall carbon nanotubes and auxiliary circuitry including transistors, capacitors and contact electrodes as taught by Brandes et al. in the device of Melzner et al. to capitalize on the semiconducting properties of carbon nanotubes.

As to the grounds of rejection under section "product by process", how the conductors are produced, either by forming and transporting on to a surface or by some other means, pertains to intermediate process steps which do not affect the final device structure. See MPEP § 2113 which discusses the handling of "product by process" claims.

9. Claims 122, 125 to 131, 137 to 141 and 145 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson et al. (U.S. Patent No. 6,185,122) and Brandes et al. (U.S. Patent No. 6,445,006).

Johnson et al. show most aspects of the instant invention (e.g. Figures 4) including an electrical crossbar array comprising two crossed conductors **20,21** defining memory element diodes **22** switchable, either reversibly or irreversibly via state change elements **23**, between two stable states free of auxiliary circuitry.

Johnson et al. do not show the conductors in Van der Waals contact and to be nanoscopic being made of single or multiwall carbon nanotubes. Brandes et al. teach (e.g. Figure 9 and Column 2 Lines 31 to 40) to have contact electrodes wires **678, 679** in electrical or Van der Waals contact and made of single or multiwall carbon nanotubes and to use diodes made of nanotubes or ropes (Column 8 lines 5 to 36) to capitalize on the semiconducting properties of carbon nanotubes (Column 8 lines 1 and 2). It would have been obvious to a person of ordinary skill in the art at the time of invention to have contact electrodes wires **678, 679** in electrical or Van der Waals contact and made of single or multiwall carbon nanotubes and to use diodes made of nanotubes as taught by Brandes et al. in the device of Johnson et al. to capitalize on the semiconducting properties of carbon nanotubes.

10. Claims 1, 3, 5, 7 to 10, 13, 14, 16 to 18, 20 to 23, 56 to 59, 90 to 104, 107 to 112, 114 to 121, 123, 124, 132 to 136 and 150 rejected under 35 U.S.C. 103(a) as being

unpatentable over Johnson et al. and Brandes et al., as applied to claim 122, 125 to 131, 137 to 141 and 145 above, and further in view of Melzner et al.

Johnson et al. and Brandes et al. show most aspects of the instant invention (Paragraph 9) except for at least one of the conductors movable from a first position to a second position. Melzner et al. teach (e.g. Figures 2 and 3) to form a memory element with conductors 5 movable between two positions U,O to make a memory device which enables the storage of considerable amounts of data (Column 1 Lines 39 to 41). It would have been obvious to a person of ordinary skill in the art at the time of invention to form a memory element with conductors movable between two positions as taught by Melzner et al. in the device of Johnson et al. and Brandes et al. to make a memory device which enables the storage of considerable amounts of data.

### ***Double Patenting***

11. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

12. Claims 1, 5, 7, 56, 90, 91 and 96 to 98 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 90 to 96 of copending Application No. 11/284,350. Although the conflicting claims are not identical, they are not patentably distinct from each other because both claim a memory device consisting of two conductors in a crossing arrangement, movable between two states and across a series of trenches.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

### ***Response to Arguments***

13. Applicant's arguments with respect to Claims 1, 3, 5, 7 to 10, 13, 14, 16 to 18, 20 to 23, 56 to 59, 90 to 104, 107 to 112, 114 to 145 and 150 have been considered but are moot in view of new grounds of rejection. Also, the Applicants' arguments about the motivation stated in Brandes et al. has been rebutted in previous office actions and those arguments are considered repeated herein.

### ***Conclusion***

14. Paper copies of cited U.S. patents and U.S. patent application publications will cease to be mailed to applicants with Office actions as of June 2004. Paper copies of foreign patents and non-patent literature will continue to be included with office actions. These cited U.S. patents and patent application publications are available for download via the Office's PAIR. As an alternate source, all U.S. patents and patent application publications are available on the USPTO web site ([www.uspto.gov](http://www.uspto.gov)), from the Office of Public Records and from commercial sources. Applicants are referred to the Electronic Business Center (EBC) at <http://www.uspto.gov/ebc/index.html> or 1-866-217-9197 for information on this



policy. Requests to restart a period for response due to a missing U.S. patent or patent application publications will not be granted.

15. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(571) 273-8300**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard Weiss at **(571) 272-1720** and between the hours of 7:00 AM to 3:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via [Howard.Weiss@uspto.gov](mailto:Howard.Weiss@uspto.gov). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached on **(571) 272-1705**.

17. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/211; 365/151; 977/ 932	Thru 4/23/2008
Other Documentation: none	
Electronic Database(s): EAST	Thru 4/23/2008

HW/hw  
25 April 2008

/Howard Weiss/  
Primary Examiner  
Art Unit 2814